

Prevalence of Darwin's Tubercle Among Females

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Abstract: Darwin's tubercle is a variable morphological feature of the external ear, occurring as a localized thickening on the upper helix. The present study investigated its prevalence, laterality, and prominence among 173 female individuals. Both ears of each participant were examined under adequate illumination, and the presence or absence of the tubercle was recorded. The observed tubercles were classified into three grades based on size: Grade I (0.1–0.4 mm), Grade II (0.5–0.9 mm), and Grade III (1.0–3.0 mm). Darwin's tubercle was observed in 37 (21.39%) individuals, whereas 136 (78.61%) showed no observable tubercle. Unilateral occurrence was more frequent than bilateral occurrence, with 12 individuals showing the tubercle exclusively on the right ear, 16 exclusively on the left ear, and 9 exhibiting bilateral occurrence. The tubercle size ranged from 0.2–2.5 mm on the right ear and 0.1–0.5 mm on the left ear, while bilateral cases showed a range of 0.2–1.0 mm. The findings demonstrate considerable variation in the occurrence, laterality, and size of Darwin's tubercle among females. This study contributes to the understanding of normal external ear morphological variation and provides baseline data for further anthropometric and comparative studies.

Keywords: Darwin's tubercle, external ear, helix, auricular morphology, prevalence, laterality, anthropometry.

I. INTRODUCTION

Darwin's tubercle is a small, congenital elevation usually observed along the upper or posterior margin of the helix of the human auricle. It was described by Charles Darwin in *The Descent of Man* (1871) and has traditionally been regarded as a vestigial or atavistic feature associated with the ancestral pointed form of the ear. Although it has no known functional significance, its presence, absence, size, and degree of prominence vary considerably among individuals and populations, making it of interest in anthropological and anatomical studies.

Previous studies have reported considerable population variation in the occurrence and morphology of Darwin's tubercle. Studies from European and Indian populations have documented differences in its frequency, laterality, and degree of expression (Ferreira et al., 2010; Singh and Purkait, 2009; Rubio et al., 2015). Some investigations have also suggested variation between males and females, although the factors responsible for such sexual differences remain unclear. The trait has therefore been considered a useful morphological characteristic for studying human variation, heredity, and population differences.

Despite several studies on external ear morphology, information regarding the occurrence and degree of prominence of Darwin's tubercle among specific female populations remains limited. The present study was therefore undertaken to determine the **prevalence, laterality, and degree of prominence of Darwin's tubercle among females**, with particular emphasis on its size variation between the right and left ears. The findings may contribute to the existing anthropological data on external ear morphology and the distribution of this distinctive anatomical trait.



II. MATERIALS AND METHODS

The present **cross-sectional observational study** was conducted among 173 healthy female volunteers aged 18–23 years from L.A.D. & Smt. R. P. College for Women, Shankar Nagar Campus, Nagpur. Participants represented both urban and rural backgrounds. Individuals with congenital auricular deformities or a history of traumatic ear injury were excluded.

Both auricles were examined under adequate illumination, with hair kept away from the ears. The presence or absence of Darwin's tubercle was assessed by visual inspection and palpation. For each participant, the **occurrence on the right or left ear, bilateral occurrence, and degree of prominence** were recorded. The prominence was classified into three grades: **Grade I (mild)**—small, barely noticeable nodosity; **Grade II (moderate)**—distinct elevation on the helix; and **Grade III (prominent)**—well-defined and clearly visible elevation.

Photographs were taken where required and coded to maintain participant anonymity. Observations were cross-checked independently by two observers to minimize subjective assessment bias. Data were compiled and analysed descriptively to determine the frequency, distribution, and degree of prominence of Darwin's tubercle among the study participants. The percentage of occurrence calculated by using formula

Total population = $\frac{\text{Number of individuals with tubercle}}{\text{Total Number of individuals observed}} \times 100$

Consent was obtained from all participants before they participated in the study and, where applicable, before photographic documentation. Participants were informed about the purpose and procedures of the study and their right to decline participation or withdraw at any stage without any consequences. Personal identifying information was not recorded, and all photographs and data were coded to ensure confidentiality and anonymity. The collected information was used solely for academic and research purposes.

III. OBSERVATION & RESULT

A total of 173 female participants aged 18–23 years were examined for the presence and morphological characteristics of Darwin's tubercle. Both right and left auricles were examined under adequate illumination. Darwin's tubercle was identified as a small, raised thickening on the upper portion of the helix. The tubercle was observed in 37 (21.39%) participants, whereas 136 (78.61%) showed no observable tubercle. Based on size, the observed tubercles were classified into three grades: Grade I (0.1–0.4 mm) (Fig.1), Grade II (0.5–0.9 mm) (Fig.2), and Grade III (1.0–3.0 mm) (Fig.3). Among the 37 participants exhibiting the tubercle, Grade II was the most frequently observed (15; 40.54%), followed by Grade I (13; 35.13%) and Grade III (9; 24.32%). This variation in prominence indicates that the expression of Darwin's tubercle is not uniform even within the same sex and age group (Table 1).

With respect to ear-wise distribution, 12 (6.93%) participants exhibited the tubercle exclusively on the right ear, 16 (9.25%) exclusively on the left ear, and 9 (5.20%) showed bilateral occurrence. Thus, unilateral occurrence was more common than bilateral occurrence, with a slightly higher frequency on the left ear. The size of the tubercle also showed variation, ranging from 0.2–2.5 mm on the right ear and 0.1–0.5 mm on the left ear, while bilateral cases showed a size range of 0.2–1.0 mm. The observed variation in size and distribution suggests considerable individual variability in the expression of this auricular trait.

The prevalence observed in the present study is comparable with the variability reported in previous studies of external ear morphology. Sowmya (2023) reported a higher proportion and greater prominence of Darwin's tubercle among males and suggested a possible sex-related difference in auricular morphology. The present study, conducted exclusively among females, demonstrates that the trait is also expressed with varying degrees of prominence in females. However, since males were not included in the present sample, direct conclusions regarding sex-related differences cannot be drawn. The findings may nevertheless provide useful baseline data for future comparative studies involving both sexes.

J. Paul and A. U. Okere (2019) reported considerable variation in auricular morphological traits among different demographic groups. The present findings support this observation, particularly in relation to the variation in the size and degree of prominence of Darwin's tubercle among individuals belonging to the same age and sex group. Similarly,



Krishan and Thakur (2019) emphasized the importance of external ear morphology in population studies and forensic anthropology, highlighting the inter-individual and inter-population variability of auricular traits. The variation observed in the present study further supports the usefulness of such morphological characteristics in understanding human biological diversity.

Joveska (2021) also reported substantial variation in the frequency and expression of auricular traits among different demographic groups. Earlier, Brody and Cohen (2011) emphasized the considerable diversity of external ear morphology, while Rubio and Galera (2015) highlighted the value of auricular characteristics in studies of population variation and biological inheritance. These observations are consistent with these findings, as we observed considerable variation in the prevalence, prominence, size, and ear-wise distribution of Darwin's tubercle among the female participants.

The slightly higher occurrence on the left ear than on the right ear observed in the present study may represent individual morphological variation. However, a larger sample involving diverse populations would be necessary to determine whether this difference represents a consistent population-specific pattern. Overall, the present findings demonstrate that Darwin's tubercle is a variable auricular characteristic among females, showing differences in its occurrence, size, degree of prominence, and distribution between the ears. The study provides baseline information on this morphological trait and may be useful for further comparative, anthropological, anatomical, and forensic studies involving larger and more diverse populations.

Table 1. Prevalence, grading, ear-wise distribution and size of Darwin's tubercle among female participants (n = 173)

Parameter	Category	No. of individuals	Percentage (%)	Size range (mm)
Presence of Darwin's tubercle	Present	37	21.39	—
	Absent	136	78.61	—
Degree of prominence*	Grade I	13	35.13	0.1–0.4
	Grade II	15	40.54	0.5–0.9
	Grade III	9	24.32	1.0–3.0
Ear-wise occurrence	Right ear only	12	6.93	0.2–2.5
	Left ear only	16	9.25	0.1–0.5
	Both ears	9	5.20	0.2–1.0
Total participants examined	—	173	100.00	—

Note: Percentages for Grade I–III are calculated among participants with Darwin's tubercle (n = 37). Percentages for ear-wise occurrence are calculated from the total study population (n = 173).

IV. CONCLUSION

The present study concludes that Darwin's tubercle is a common auricular variation observed in females; however, it shows greater prominence but lower frequency among females. The study highlights that Darwin's tubercle, though a vestigial feature, remains an important marker for anthropological and genetic variation within human populations.

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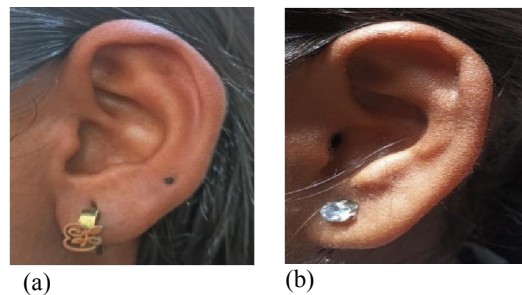


Fig.1: Image(a-b) showing presence of grade I Darwin tubercle on subject ears.

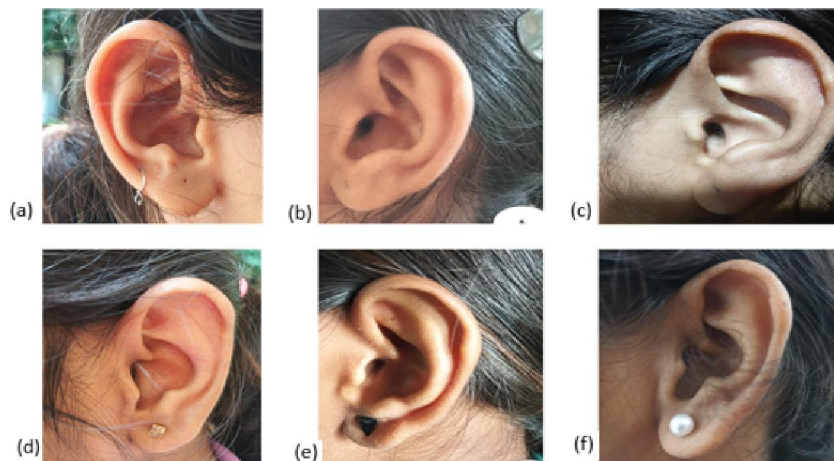


Fig.2: Images (a-f) showing presence of grade II Darwin tubercle on subject ears.



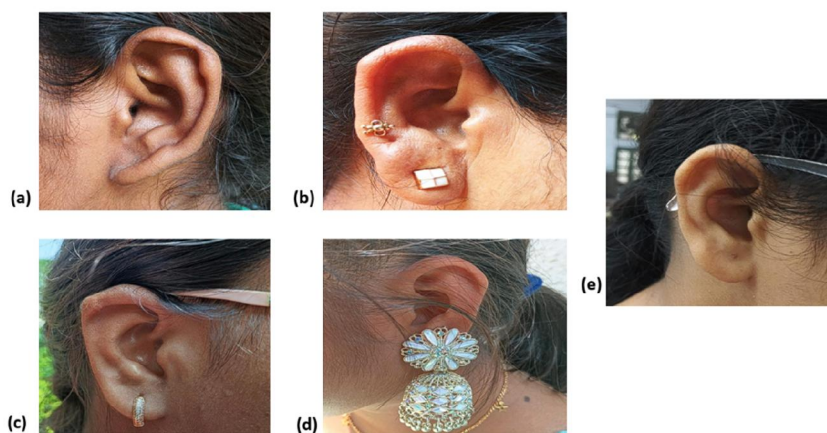


Fig.3: Images (a-e) showing the presence of Grade III Darwin tubercle on the subject's ears.

